

However, the mobile-to-mobile demand is estimated to constitute less than 3% of the total potential mobile satellite market.

For the mobile-to-fixed user the round trip transit time, from the end of one party's utterance to the time a reply can come back, is about 1/2 second (although the satellite industry convention for expressing this phenomenon is a "quarter second delay" per link). While there is an indication that this delay takes some getting used to, people do get used to it. We feel confident that the vast economies of CELSAT's HPCN service will make any reasonable amount of signal delay readily tolerable, especially where access to an HPCN ground cell (for which no delay exists) is unavailable.

Additionally, while the stated 100 milliseconds coding delay is representative of today's state of the art in vector encoding, it is not a reasonable projection for the four year future to CELSAT's projected first service.¹⁹ Based upon a conservative projection of gains in the last four years, we feel that 50 milliseconds coding gain is a most likely projection. In addition, higher bit rates will be available to users willing to pay the extra cost for slightly higher quality service.

At least one respondent appears to have seriously misunderstood CELSAT's representations with respect to the ability of an HPCN to reuse the spectrum both on the space-based and ground-based systems:

¹⁹ Specifically, GTE states:

"CELSAT proposes to use a low 5 kbps VOCODER rather than that used by Qualcomm, and justifies this on the grounds that CELSAT's system will not be deployed for several years, and by the time it is, there will high quality speech coders available at this lower bit rate. GTE believes this is speculative, " GTE Comments, in Opposition, PP p. 10

and:

". . . the FCC should recognize that low rate speech encoders typically involve delays of 100 msec. or more, which when added to the 500 ms satellite delay, may be annoying to users." GTE Comments, in Opposition, PP p. 13

" [The] "hybrid" nature of its cellular/satellite system in which both the cellular and satellite elements operate simultaneously using the same band. However, elsewhere in its petition, Celsat itself demonstrates that such a concept is unworkable. Celsat itself thus establishes the infeasibility of one of the major benefits it claims from its proposed service." MSC RM p. 5.

Contrary to this inference, CELSAT believes that its Petition is quite clear on this point. See, Petition, at. pp. 12-14 . No where has CELSAT proposed or represented that the same subbands would be used simultaneously in the same space cell both by the ground system and by the space system. What Motorola has done, however, is to confuse unfairly the point that the ground cell subbands cannot be simultaneously shared by different licensees except under the jurisdiction of one network controller. Petition, pp. 43-44.

C. LQSS's Threats To Deny CELSAT Access To CDMA Technology Is Serious, And Reflects Adversely On Its Own Right To Any License Or Preference

It is hard to imagine let alone recall a more blatant example of both an abuse of the Commission's licensing process and a potentially unlawful anticompetitive threat to a would-be competitor than that manifested by LQSS' attack on CELSAT on behalf of its partner, Qualcomm as reflected in the following excerpts from its pleadings in this case:²⁰

"Moreover, as discussed in LQSS's opposition to Celsat's petition for rulemaking, to demonstrate the feasibility of its system, Celsat must show that it can use the technology which it proposes. As noted above, much of Celsat's proposal apparently is based on the use in both its space and ground segments of CDMA technology, developed by QUALCOMM. . . . However, Celsat does not have this technology available to it for CELSTAR. QUALCOMM does not have a licensing agreement or any other agreement with Celsat, which would be required for Celsat to use QUALCOMM's CDMA technology." LQSS Opposition, PP. p. 11. [Emphasis added.]

²⁰ In the context of the development of the FCC's Part 68 CPE Registration program parties reacted to AT&T's early suggestions that it might indirectly control network access by others by reason of its control over all the relevant patents covering the telephone plug and jack configurations then being considered as Part 68 standards. In response to the threat of patent abuse and abuse of the Commission's open interconnection policies and objectives, the Commission penalized AT&T by requiring that it make its plug and jack technology and patents available to the public, royalty free.

"In short, Celsat has not only failed to demonstrate that its system is technically feasible, but it has also failed to demonstrate that the technology purportedly essential to operate CELSTAR is available to Celsat for use in its HPCN. Because Celsat has failed to show the technical feasibility of its system, its request for a pioneer's preference must be denied." LQSS Opposition, PP. p. 12. [Emphasis added.]

Granting Celsat's request for a pioneer's preference would not advance the Commission's goal[s] Because the technology Celsat proposes to use is derivative, no manufacturer would be encouraged to make its innovations available to the public if an applicant such as Celsat were awarded a preference. Therefore, in order to promote the Commission's pioneer's preference policy and the public interest, Celsat's request must be denied. LQSS Opposition, PP. p. 14.

It is clear that this is not just an ordinary attack on either the merits of a worthy alternative proposal, or of the procedural process at issue here. Rather, it is an opening canon shot intended to blast an emerging competitor out of the running even before it gets its application filed. It is also a strongly inhibiting signal to other potential competitors that they better think twice about stepping into the MSS/personal communications arena if they intend to use spread spectrum CDMA technology of any kind.

Possibly most devastating to CELSAT is the fact that Qualcomm's apparent intentions to deprive CELSAT of access to its 1.25 Mbps CDMA technology has already been a factor in causing one potential interested investor to condition its investment in CELSAT on securing confirmation that CELSAT will have access to Qualcomm's technology. This condition was conveyed in March, 1992, and at a follow-up meeting between the investor representative and CELSAT principals on April 14, 1992 -- one week after the LQSS filings CELSAT was tentatively turned down. The Qualcomm position (as reflected in the LQSS Comments) effectively was the factor.

The Commission should not tolerate such arrogance and anticompetitive predisposition by a prospective new licensee. Similarly, this kind of conduct and attitude ought to be taken into consideration by all in the industry who participate in the evaluation of Qualcomm's proposals for CDMA industry standards as a signal that Qualcomm might cause problems in the future for users and manufacturers which rely in good faith on the practical workability of the standards process.

Accordingly, not only should the Commission totally disregard LQSS' arguments in opposition to both its Petition and its Request for Pioneers Preference, but it should also condemn them as absolutely contrary to its procompetitive policies and its Pioneers Preference goals and objectives.

Finally, on the basis of this manifested intent and predisposition, the Commission should deny the Pioneers Preference request pending for LQSS.²¹

1. Qualcomm Does Not "Own" CDMA

LQSS, in its request to deny CELSAT's application, appears to claim that Qualcomm invented CDMA and has exclusive rights to it. This is a most unusual, misleading and extreme position. CDMA has been in widespread use for over three decades by the military and has been proposed at various times to the FCC prior to Qualcomm's inception.

CELSAT's founders first proposed CDMA for the GPS/Navstar system in the late 1960's, and all elements of that system were well proven even at that time. CDMA has found extensive military utility in many systems as a result of its special properties related to antijamming and security. Thus, uses predate Qualcomm by decades. There was a time when only the military could afford CDMA, but now with large scale integration it is affordable commercially.

CELSAT did not commit in its filings to the use of a Qualcomm-specific hardware implementation or to the use of hardware as provided by one or more of the many Qualcomm licensees. It merely committed to the use of an emerging cellular standard, one that CELSAT feels confident will be an "open" CDMA standard. Considering the potential huge requirement for HPCN handsets, and considering further its

²¹ Request for Pioneers Preference by Loral Qualcomm Satellite Services, Inc., Docket No. ET 92-28, File No. PP-31. In this connection, the Commission is reminded of the actions it took recently in conditioning the permanent licensee authority granted of GTE Airfone on its willingness not to seek enforcement of preexisting contracts with airlines which might serve to inhibit new entrants in the air-to-ground phone service.

likely direct or indirect compatibility with other CDMA personal communications systems operating here or initiated in other parts of the world on the same or nearby bands, this makes sound design sense. CELSAT does not believe that the cellular industry would accept a monopoly position by Qualcomm or any of the other companies now developing CDMA hardware.

2. LQSS's Hysterical Reaction To CELSTAR® Is Misguided

LQSS claims that Celsat has no rights to use the CDMA technology which is critical to the implementation of its HPCN concept is both faulty and misguided:

"With respect to CDMA . . . Celsat has had no role in its development and as discussed below, no current right to use the architecture proposed." LQSS Opposition, PP. p. 7, fn. 5.; also LQSS Opposition, PP. p. 6.

* * * * *

"Much of Celsat's proposal apparently is based on both its space and ground segments of CDMA technology developed by QUALCOMM, Inc., one of the two shareholders in LQSS. For example, in describing itself as "wedded" to CDMA technology Celsat states that the results of its analysis were consistent with the successful field trials of CDMA in San Diego. These field trials in San Diego were by QUALCOMM and associated companies. . . However, Celsat does not have this technology available for CELSTAR. QUALCOMM does not have a licensing agreement or any other agreement with Celsat, which would be required for Celsat to use QUALCOMM's CDMA technology. In short, Celsat does not now have the right to use the CDMA technology essential to the operation of CELSTAR. Even if its petition were granted, it would not be able to construct and operate its proposed system. Therefore, its petition should be dismissed as moot." LQSS RM p. 8-9.

The industry and FCC are fully aware of and indebted to QUALCOMM for its central role in developing the emerging CDMA cellular standard. But no "obfuscation" of Qualcomm's contribution was intended in and CELSAT is certain that none resulted from the Petition references cited by LQSS in this connection. (LQSS, PP p.6 and p.11).

If the good intentions of all parties materialize, there will be a Cellular Telephone Industry Association, CAI CDMA *standard*, not owned by any one organization, now or in the future. On March 6, 1992, Qualcomm introduced its CDMA 1.25 Mbps coding scheme as its contribution toward a cellular industry standard at a meeting of the Telephone Industry Association's TR 45.5 Subcommittee in Tempe Arizona.

Considering the industry consensus around that proposal (even well before it was official "contributed" as a TR 45.5 submission) CELSAT recognized that conformance with this emerging standard would make it a prudent element, but not "the key" element of its design.

As to *implementation* of this design, QUALCOMM has developed some leading circuitry and a strong patent position in accord with its proposed standard, and has offered that technology for sale. Purchase and building upon that development represents, one implementation option, but certainly not the only one. If the CDMA standards do emerge from the industry associations and achieve the importance that CELSAT and others expect it will, there will be a healthy world-wide multi-sourced competition in equipment development. Indeed, Qualcomm has already licensed its CDMA technology to numerous sources, several of which could supply CELSAT CDMA devices.

3. CDMA Poses No Barriers To CELSTAR®

CELSTAR, alone so far as it can tell among all applicants, clearly stated in its petition that suitable high quality 4.8 kbps CELP encoding is not generally available today but is "expected to be practical .. within four years." (Petition, Appendix A, p. A-5) This would be very near the time of CELSAT's first satellite use. Further it was pointed out that if actual availability is later than projected the impact is minimal if any. This is because CELSAT's enormous satellite capacity will be available immediately with the launch, whereas it will take some time for its sales to ramp up to a point where enough users will be able to take advantage of all that capacity. Thus, there will be a surplus of capacity in the first few years.

Most important, the transition from old to newer, more efficient technology when it does come is totally graceful due to the wide tolerance of CDMA for different source types within its multiplex. Different encoding technologies can be incorporated together in any mix in the CDMA multiplex with no adverse incompatibilities. Significantly, *all* of the major applicants in the current competition (with possible exception of AMSC) concur explicitly with the CELSTAR use of 4800 bps. Contrary to GTE's misreading

of the LORAL-QUALCOMM application, *each* of them, including LQSS, has also used 4800 bps encoding in their link budget for the purpose of power/capacity calculations.²² Only AMSC of all the major current players has quoted a higher rate, and that appeared only in their now four-year old original application. So contrary to GTE's critique, a fair comparison with other parties' capacity calculations can *only* be made at 4.8 kbps. (GTE RM, p 10.)²³

The details on CELSAT's Code Division Multiple Access ("CDMA") technique would also need to be made available to allow critical review of claimed capabilities and capacities. Comparative costs for ground cells between the L-Band, US-Band and 1.85 to 2.2 GHz Band would also assist the Commission in evaluating alternatives. GTE RM, p. 4

Celsat claims that it will be offering data services at rates up to 144 kilobits per second. Celsat Petition, Appendix A, at A-10. It also claims that the basic modulation and multiple access protocol of the CELSTAR system is designed to fit exactly the emerging standard of CDMA ground cellular system." Id., at A-1.

²² Specifically: Globalstar. Application. 3 June 1991, pp. 181-183. System A: "28,800" = **4800**/(1/6) (1/6 is TDD duty cycle), pp. 184-186. System B: "**4800**" (100% duty cycle in system B). Iridium. Application. 12/90, p.66. "**4800 BPS VSELP**". Ellipsat. Application. November 2 1990. Code rate not given but C/No assumed for capacity calculations, "41.5" dBHz, Appendix B, p.1 is essentially identical to CELSTAR's (Eb/No=4.5, R=4800,) C/No = **41.3** dBHz. (C/No is the factor that matters for CDMA capacity calculations, not R). Oddysy Application. May 31, 1991. p.40a. "**4800**" bps. Aries. Application. June 3, 1991. p. B-4 "**4.8kbps**" p. C-8 "**4.8kbps**". Table C-2 "**4.8**".

²³ See, also, TRW:

"CELSAT notes that its proposed system transceiver uses an analog voice waveform encoding system based upon 4.8 kbps CELP encoding, which CELSAT admits is not even expected to be available in the next generation of digital cellular phones. CELSAT simply pronounces, without support, that 4 kbps ASICs will be available within a few years." TRW Petition to Dismiss or Deny p. 13, fn. 9.

As to the LQSS statement to the effect that Qualcomm has a 9.6 Kbps limit while CELSAT has proposed up to 144 Kbps, this merely reflects a lack of understanding on LQSS' part.²⁴ It is a well known fundamental fact that there can easily coexist a number of 9.6 Kbits/sec users utilizing a cellular system standard along with users operating at either 9.6 Kbits/sec. or at variable data rates up to and even greater than 144 Kbps in a system such as CELSAT's HPCN. CELSAT's HPCN is transparent to such varying users. If, by the time of HPCN deployment, Qualcomm does not have a 144 Kbps product, CELSAT is confident that it or someone else will.

D. CELSTAR® Is Commercially Viable

Only one commenter expressed any doubt whatsoever about CELSAT's extraordinary cost advantages over the other proposed mobile satellite systems, and its doubt apparently was based on the fact that CELSAT provided little cost detail in support of its claims. GTE Comments, Opposition to PP, p. 7, fn. 5.

CELSAT'S capital cost estimates can be expanded easily. At TABLE I, *supra*, and FIGURES 3 and 4 of CELSAT's Request for Pioneers Preference (pp. 22-24; also, Rulemaking at pp. 17-20) CELSAT set forth both its estimates of (i) the equivalent annual capital cost and (ii) annual cost per equivalent voice circuit minute for CELSTAR converge by a single satellite over the entire U.S., Hawaii, Alaska, Puerto Rico and the U.S. Virgin Islands. CELSAT has reliably estimated these costs to amount to about \$640 in annual capital cost per circuit over the life of the satellite, and less than one cent per operating minute for a 5 kbps voice grade or equivalent communication channel. These estimates have been derived using the following cost data and operating assumptions. The cost of coverage using two satellites, as proposed, would be about twice the costs shown.

²⁴ LQSS states:

"The emerging standard based upon QUALCOMM's CDMA system has a maximum data rate of 9.6 kilobits per second. Thus, it intends to offer higher data rates, which would be incompatible with the emerging digital cellular standard. " LQSS RM p. 9-11.

**CAPITAL COSTS FOR SATELLITE INFRASTRUCTURE
(\$Millions)**

Satellite	\$110,000,000
Booster	\$90,000,000
Insurance	\$20,000,000
Total	<u>\$220,000,000</u>
Satellite Life, yrs.	12.5
Annual Depreciation	\$17,600,000
Circuit Capacity/Satellite	27,500
Annual Depreciation/Ckt.	\$640
Business Days/yr.	250
Effective Hours/Day	10.5
Voice Circuit Cost/Min.	<u>\$0.004</u>

It should be noted that none of the experienced satellite parties to these proceedings challenged CELSAT's cost estimates as initially presented.

A large market exists for CELSAT's multifaceted services:

CELSAT's ability to offer a wide variety of wireless services through a low cost hybrid space and ground network, ensure that demand will exist for its huge potential capacity. Many of these services (e.g., cellular and paging) have well-established demand patterns and rapid growth. Others, (data, position determination and compressed video) because of recent advances in key enabling technologies, appear poised for surging demand and even more rapid growth. This perceived market demand and the prospects for growth are discussed further in CELSAT's SUPPLEMENTAL APPENDIX F.

Other Challenges to Commercial Viability:

LQSS made a few claims to the effect that CELSAT's proposed system is not commercially viable, allegedly for the following reasons:

"- With its current proposal, CELSAT would not be able to serve subscribers of either existing cellular networks or emerging PCN systems. CELSAT would be required to overbuild these networks in order to have a customer base sufficient to justify the financial outlay required for CELSTAR. Such an overbuild does not appear commercially viable.

"- CELSAT claims that its proposed system will provide more than 55,000 voice circuits in its first generation system. However, CELSAT does not explain how it will use these circuits. . . [I]t appears that CELSAT proposes to use most of its space segment capacity to provide data circuits, and to rely on its ground segments to provide voice service. CELSAT's proposed integrated "space/ ground cellular network" would thus be nothing more than a conventional cellular system with satellite paging services." LQSS Opposition, RM, p. 10.

In both respects, the criticism is unwarranted. First, while it is true that CELSTAR will not operate and does not propose to operate with existing cellular systems, that fact does not make it commercially non-viable. To the extent that other proposed systems represent that they will work with existing ground cellular systems on a "dual mode" basis, they cannot reasonably expect to enjoy any significant revenue from their customer's use of existing ground systems. And without new dual mode handsets, users of existing ground systems will contribute nothing to the satellite carrier's bottom line. Thus, it is hard to appreciate how any degree of compatibility with existing ground systems contributes significantly to enhancing the commercial viability of any MSS satellite system. What is more important is that CELSTAR, unlike any other MSS system, will support both ground- and space-based personal communications automatically and transparently with one, common handset or other transceiver.

Second, it is not true, however, that CELSTAR will not support PSNs. To the contrary, as discussed in SUPPLEMENTAL APPENDIX F, the HPCN approach lends itself in many ways to supporting future PCNs and PSN systems.

Third, while it is correct that CELSAT's HPCN contemplates a substantial overbuild of existing ground cellular capacity, it is incorrect that such overbuilding will detract from HPCN's commercial viability. As the Commission is well aware, there continues to exist an enormous, growing demand for more, especially low cost, ground cellular service. There is no reason to suspect that, especially with HPCN's greater

functionality and lower prices, that that demand will not be there when HPCN is approved and deployed. And as for the potential capital demands on CELSAT's ability to bring such buildout to fruition, again CELSAT would point to the fact that it neither intends, nor is it necessary that CELSAT either construct or operate all of the HPCN ground system capacity.

In fact, as CELSAT's clarified request below for a limited Pioneers Preference indicates, subject to changes in the Commission's rules it is contemplated that there will exist several different entities building out the ground system, and possibly hundreds of entities constructing microcells -- all with their own, independently acquired capital resources. Irrespective of how commercially successful these other entities prove to be, CELSAT's commercial viability on the space segment is virtually assured by the space cell traffic which the customers of these ground-based operators will generate.

Finally, the point that, with all its space capacity available for data CELSAT will merely look "like a cellular system with a paging capability" hardly needs to be addressed. Suffice it to say that CELSAT envisions many, many uses for its 144 kbps circuit capacity, and sending mere paging signals is low among them.

IV. CELSTAR® IS THE MOST INNOVATIVE PROPOSAL BY FAR,
AND, AS SUCH, IS DESERVING OF A PIONEERS PREFERENCE

CELSAT's Celstar System Exemplifies Innovation

On April 8, 1992, Motorola, TRW, Loral/Qualcomm, GTE and AMSC filed comments regarding CELSAT's request for a pioneer's preference, which, to one degree or another, argue that CELSAT's proposed system provides "nothing innovative" and should not receive a pioneer's preference. ²⁵ A subset of these firms also

²⁵

For example, LQSS argues the whole gamut:

"CELSAT has no basis for and does not merit a pioneers preference: (a) it has not developed new or innovative technology, as CELSAT itself admits; (b) CELSAT is not an applicant, no application having been filed by it; (c) CELSAT's rulemaking petition does not propose viable plans, making its pioneer's preference request moot; (d) CELSAT has and cannot demonstrate the viability of its proposal; (e)

argues that CELSAT has not provided evidence to support its claims of innovation and therefore failed to meet the FCC's criteria for awarding a pioneer's preference.

Three of the above named companies have applied for an allocation of spectrum in the RDSS band and state that their proposals are "worthy" of being granted a pioneer's preference. They assert that their proposals qualify for a pioneer's preference despite clear inferiority to CELSAT's Celstar system.²⁶ CELSAT vehemently disagrees with the self-serving comments of these companies and provides ample evidence below to refute their claims. After a thorough, unbiased review of CELSAT's proposed system, one can not help but conclude that CELSAT proposes *true innovation* in mobile communications on a par with few innovations in *any* technological field over the past decade.

Any one of CELSTAR's distinctive characteristics serves to qualify CELSAT for a Pioneer's Preference, and collectively they represent the following staggering new capabilities:

-- Eight times as many space circuits as the next best system with an additional order of magnitude more ground circuits.

CELSAT's proposal is based on use of technology to which CELSAT has no rights;

Continued from previous page:

and (f) CELSAT's proposal is inconsistent with Commission rules and its open entry policy. " LQSS Opposition, PP. p. 2.

Also, Motorola: "[m]oreover, CELSAT never identifies the specific technologies that it believes deserve a pioneers preference. In this regard, the cornerstone of Celstar system - large aperture, multi-beam and CDMA - are well-known and certainly not innovative." Motorola Comments pp. 25

²⁶ TRW's apparent real concern is that any recognition of CELSAT's true "innovativeness" will distract from the possibility that it might also receive a license:

"The grant of a nationwide pioneer's preference to CELSAT would serve to deny the other RDSS-band applicants their statutory rights to full comparative consideration, as the principal focus of the Commission would be on the "innovativeness" of CELSAT's proposal, rather than on the relative technical merits of all of the pending proposals. TRW Petition to Dismiss or Deny p. 16. "

As pointed out above, however, a grant of a pioneers preference to CELSAT should neither delay nor deny the grant of a license to others willing and able to share the RDSS band.

- Four times more frequency efficient than the next best space system and more than 50 times more frequency efficient when CELSAT's ground circuits are included.
- One eighth of the annual cost per circuit than the next best system.
- One-fifth the RF power of any alternative

CELSAT will also offer a new standard in integrated system capability. The same transceiver can be used for any and all of the following:

High Quality Voice

Variable data rates, 75 baud to 144 kbps. This will take digital mobile transmission beyond the 9.6 kbps barrier to new heights

Accurate, timely position determination to moving and stationary users

Fax - regular and high speed

Privacy and security

Compressed Video

As clearly detailed in CELSAT's Petition for Rule Making, the system elements necessary to yield these new pinnacles of performance are:

- The use of CDMA
- The Hybrid space and ground cellular system and
- A network controller to regulate traffic to either a space cell, or a ground cell.

This latter concept is protected by U. S. Patent #5,073,900 issued on December 17, 1991, which is included at SUPPLEMENTAL APPENDIX B. As is well known, a patent is issued only for an innovative concept.²⁷

²⁷ Cf., TRW, "[w]hile CELSAT notes that one of its founders holds a U.S. patent for an integrated cellular communications system design, CELSAT makes no claim that such patent is the basis for its CELSTAR system, or even that its CELSTAR system is based on innovations in technology. . . . Rather, CELSAT acknowledges that the high technology elements for its proposed system are currently available in the United States, but makes no claim that it was in any way responsible for their development." TRW Petition to Dismiss or Deny p. 13.

Any failure on CELSAT's part expressly to make such a claim was an oversight. Let it be clear that CELSAT does believe that it and its founders are responsible for development of the HPCN concept.

Finally, in a letter of March 25, 1992 to David D. Otten, CELSAT's C.E.O., the United States Space Command (Col. J. C. Garbrous, Acting Deputy Director, Space Systems), wrote "[t]o summarize, even though neither the CINC nor the Command can formerly petition the FCC on your behalf, we appreciate the opportunity to review your proposal and are enthused by your innovative approach." See SUPPLEMENTAL APPENDIX, D. The responsible Space Command officer was initially General Robert Stewart, now retired. He states in a separate letter "we found all elements of the concept technically feasible and well within today's state of the art. We see no unusual difficulty in implementing the system at approximately the cost indicated by CELSAT. We see tremendous potential benefits to the military from CELSAT's unique capability as an Integrated Communications Navigation and Identification (ICNI) system."

The Commission should give due weight to the strong endorsements offered by these two highly qualified officers.

A. Innovation At The Most Technical Level

At the outset it should be noted that *no current proposal* under consideration is based upon *fundamentally* new technology. CDMA, coding, low altitude satellites, communication satellites, wide-band communications repeaters -- all of these fundamentals are at least 30 to 50 years old and have dozens and hundreds of instances of application.

Yet, the contribution of CELSAT is to have uniquely combined these proven elements in a comprehensively optimized system *application* of such vastly increased capacity, spectral efficiency, and economy as to represent a *qualitative* breakthrough in the service, economy, and potential market extension that can be offered to the public for mobile/personal communications.

The Pioneer's Preference rules (Section 1.402) provide that granting of such be based upon a consideration of whether or not:

"... the petitioner has developed an innovative proposal that leads to the establishment of a service not currently provided or a substantial enhancement of an existing service."

CELSTAR, more than any other current applicant satisfies this definition:

1. The *Hybrid* PCN concept is, to our knowledge, the first such proposal received by the FCC. Fundamental aspects of this service are covered by the CELSAT patent, *supra*. The service this affords to the user is vastly beyond the concept of a "dual-mode" handset offered by other current contenders.

2. The CELSTAR satellite element alone offers true *order-of-magnitude* enhancement of US capacity and spectral efficiency as compared to any other current contender.

As to the latter, in the last two months LQSS and MOTOROLA particularly have battled *fiercely* over the issue of who has the greater capacity and spectral efficiency. The differences they have been arguing about with awesome ferocity are in the range of a mere 25% in capacity and 2/1 in spectral efficiency. There can be little doubt that these organizations consider that these two factors may be, or should be decisive in the judgment of merit from the FCC's point of view, and that they consider improvements of that order significant.

CELSAT concurs. By contrast, however, the advances in this respect offered by the CELSTAR system are a *factor of 10* (60905 vs 6500) increase in US capacity and a *factor of 4* (1903 vs 358 US ckts/MHz) further improvement of the spectral efficiency beyond that claimed by *the most efficient* of any of the presently competing proposals.

There can be no doubt that the CELSTAR proposal meets both the letter and spirit of the Pioneer's Preference rule in far greater degree than any of the current other competing mobile satellite proposals.²⁸

²⁸

AMSC states:

"In addition, CELSAT has failed to submit any showing that its proposal is truly innovative. The concept of a single mobile satellite system using terrestrial and satellite elements in different geographic areas on the same frequencies is not novel. AMSC understands that there is a system operated by the U.S. military that is consistent with this concept. While such has not been implemented commercially to date, simply proposing such a concept should not be the basis for

B. Innovation At The Service Level

CELSAT Meets Criteria For Award of a Pioneer's Preference

The FCC's Report and Order²⁹ outlined the Commission's initial criteria for awarding a pioneer's preference:

"A party that demonstrates that it has developed an innovative proposal that leads to the establishment of a communications service not currently provided or a substantial enhancement to an existing service, provided that the rules for the new or existing service follow from the proposal and lend themselves to the grant of a preference and a license to the innovating party. We indicated that a qualifying innovation could be added functionality, a use of the spectrum different than previously available, or a change in the operating or technical characteristics of a service."

Below CELSAT provides further irrefutable evidence that its system clearly meets each test for the award of a pioneer's preference.

**A communications service not currently provided
or a substantial enhancement to an existing service**

We believe that CELSAT passes the "new services not currently provided" test through proposed provision of the following :

the grant of a pioneer's preference."

Then, AMSC totally reverses its criticism by questioning whether the very system concept which it says "already exists in the military" will even work, technically: "[b]efore CELSAT can be considered for a pioneer's preference, it at least must demonstrate that it has developed and tested the technology to create such a system and that this technology works and is truly innovative." AMSC Opposition, PP p. 8. If such a system exists in the military, is the Commission to believe that it doesn't work? What is important is that AMSC needs to be much more specific in its representations of what it knows to exist in military systems which would bare on CELSAT's claims.

²⁹ GEN Docket No. 90-217, 6 FCC Rcd 3488 (1991)

-- Prior to CELSAT's filing, no firm had proposed wideband data transmission at a rate of 144 kbps over a national wireless cellular network. Other cellular data rates (e.g., the emerging CDMA standard at 9.6 kbps) tend to be much lower. CELSAT proposed 144 kbps, although rates up to 500 kbps are technically feasible, to serve a wide range of users. As a result, CELSAT can offer new quality standards for multimedia applications and compressed video.

-- Cellular service from a single, low power, small handset that has the ability to switch from satellite to ground circuits and vice versa during an on-going call automatically, without the user doing anything. There is all the difference of night and day between Motorola's and Ellipsat's "dual mode" handsets and CELSAT's HPCN. Only CELSAT offers a functionally integrated system capable of offering:³⁰

- seamless roaming between metropolitan and rural (ground and satellite) coverages.
- automatic handover under difficult obstruction conditions.
- RDSS
- dynamic load shifting between satellite and ground elements for most efficient, least cost service.³¹

-- CELSAT provides ubiquitous, nationwide cellular service for rural users. The CTIA reports that today's cellular covers approximately 92% of the nation's population. This means that 20 million Americans do not have access to cellular service in their "home" market. While other satellite systems may cover these potential users, none can do so at the price points possible with

³⁰ GTE states that ". . . it is not sure who first proposed integrating mobile satellites with terrestrial-based mobile systems, but it claims it was not CELSAT. (Citing paper by E.S.K Chien, et al.) GTE Comments in Opposition, PP p. 9. As AMSC's reference to its suspicion that there exists similar systems in the military, GTE has failed to provide any specifics regarding the integration which it claims has been written about before. In any event, CELSAT is not merely "writing" about a concept, but it has reduced it to a form which is both technically and economically viable, and therefore is ripe to be put into commercial practice.

³¹ Motorola conveniently fails to appreciate the functional differences between CELSAT's true "hybrid" dual use, and its own scheme and the separate conventional systems of others:

" . . . there is nothing novel about CELSAT's proposed service. Cellular radio service is well established [and] the U.S. Mobile satellite service delivered by geostationary satellite is something American Mobile Satellite Corporation (AMSC) received a construction permit to provide in the upper band some years ago. Nor is the "hybrid" concept novel. Motorola, for one, proposes that the hand units used with its Iridium system will be "dual-mode," i.e., capable of operating both cellular or mobile satellite frequencies. The units will switch automatically from cellular to satellite if cellular is available. " MSC , RM p. 4.

In this connection it should be noted that, in contrast to the Motorola "dual mode" operation, CELSAT's solution will switch from one type cell to the other and back again when ever the strongest of the two signal sources is temporarily interrupted (e.g., behind a building or in a valley), and not just when the ground signal is lost. Other criteria that can also be used by CELSTAR for such automatic switching from one cell type to another not available using dual mode sets as proposed by others include minimizing cost, best use of available circuit capacity, emergency override, etc.

CELSAT's system, namely 25 cents per minute. This price point, well below that available in most cellular systems, will place rural America on an equal footing with urban America in their ability to receive inexpensive, quality cellular service.

-- CELSAT will provide inexpensive position determination services using the same low cost handset used for voice communications. For example, a long haul truck carrying a critical shipment of components as part of a just-in-time inventory management system could be tracked from the signal of a driver's mobile or personal CELSAT phone. A calculation of the estimated time of arrival for the shipment could avoid potential problems that might cause an interruption in the smooth operation of the plant. Position determination service would be available to users without requiring any additional hardware.

-- CELSAT's hybrid satellite and ground/microcell system provides an enormous gain in capacity, with 60,905 satellite voice circuits and in excess of 700,000 ground/microcell circuits as part of one integrated system in the same allocated band. (No "dual mode" system has proposed this.)

-- The use of CDMA technology allows a high degree of privacy and security not found in today's cellular networks.

-- Finally, CELSAT's system allows the concept of one universal number assigned to a multifunctional transceiver (voice, data, position determination, paging and fax) to easily send and receive anywhere in the U. S. to become a reality.³²

The above services constitute a *substantial* enhancement to an existing service and clearly pass the specified test.

³² GTE, in its perverse way, goes to great lengths to diminish the quality of CELSAT's functional achievements:

"[I]t would be interesting for CELSAT to describe why CDMA on its system offers users privacy while claiming that conventional cellular - which can also use CDMA - cannot offer privacy." GTE Comments, RM, p. 4.

As GTE must know, current ground systems are yet converted to CDMA and might never do so.

"Also, contrary to CELSAT's claims, GTE's Follow-Me-Roaming capability currently allows subscribers to automatically receive communications while outside their home system" and similar capabilities are already part of current industry standards. CELSAT should try to remain up-to-date with current technology before criticizing it or claiming it cannot do something." *Id.*

CELSAT is up-to-date; its GTE who is behind the times if it believes that its gerrymandered, user-intense feature is even a close substitute for the true universal personal number function.

CELSAT's system provides added functionality

The seven new or enhanced services cited above provide new functionality. Additional examples of CELSAT's increased functionality are: longer battery life on portable handheld transceivers due to low average operating power (0.1 watt for CELSAT versus 0.5 watt for other proposed satellite systems and 0.6 watt for today's cellular); a small profile antenna; the ability to determine location to accuracy of 300 meters, requiring only a CELSAT compatible transceiver; ability to provide voice, high speed data, high speed fax, and compressed video; single, universal personal telephone number offering the opportunity to be called and reached anywhere in the United States; and space and ground cellular access with a "single mode" handset.

CELSAT provides a different use of the spectrum than previously available

Since CELSAT has the only integrated space/ground cellular system proposal plus position determination service, it clearly represents a different use of the spectrum than previously available.

CELSAT provides a change in the operating or technical characteristics of a service

One handset that provides ubiquitous coverage anywhere in the United States that can in the same call communicate through satellite or ground service surely meets the change in operating characteristics for cellular criterion.

Update On Pioneer's Preference Requirements

On February 26, 1992, the FCC issued Memorandum Opinion and Order FCC 92-57. This memorandum specified additional criteria for the award of a Pioneer's Preference. CELSAT meets these "more specific" criteria and should be awarded a Pioneer's Preference.

First: The proposal must be an innovation of some significance

The most fundamental innovation in CELSAT's proposed system lies in the elegance and simplicity of a system architecture that combines the best of mobile satellite technology with the best of ground based cellular technology to produce a feature-rich, low cost, *flexible*, personal communications platform that outperforms all other proposed systems by a wide margin. If licensed, CELSAT's system truly has the potential to bring low cost mobile communications to the masses and cause an unprecedented shift in the way people in this country communicate.

CELSAT believes the power of its proposed system is such that for individual mobile communications it rivals the impact personal computers had on individual data processing. In fact, briefly reviewing the nature of the innovation caused by the invention of the personal computer sheds insight into the magnitude of CELSAT's innovation. Although Apple's initial personal computer used largely off-the-shelf components and existing state-of-the-art technology, it packaged and assembled these elements into a new system that created a major paradigm shift in computing. This paradigm shift involved a fundamental shift away from centralized data processing, empowering individuals with a new tool to control their information needs.

Similarly, CELSAT's proposed system has the potential to fundamentally change the way individuals view and use mobile communications. CELSAT's ubiquitous satellite coverage allows individuals to "stay in touch" anywhere in the U. S. they may travel. Integrating CDMA spread spectrum ground cellular with a large antenna satellite and a network controller provides immense capacity at a very low cost. This integrated network platform and its ability to use small, lightweight, low power transceivers, in turn allows the full complement of Personal Communications Services to become a reality. CELSAT sees this flexible, innovative platform allowing a host of new and enhanced services that will transform the way most individuals think about and use mobile communications.

CELSAT sees the emergence of a new personal communications paradigm where mobile communications becomes:

- ° Not just a corporate or business tool, but a fundamental personal consumer necessity;
- ° Not just a luxury item for the well-off, but affordable for the masses;
- ° Not just a travel aid for urban travelers and dwellers, but an indispensable appliance for all American's, whether rural or urban based;
- ° Not just a single function device, but a multifunction transceiver able to send and receive multiple digital signal formats (e.g., paging, voice, fax, data, compressed video);
- ° Not just a mobile (automotive) phone, but a personal portable communications device that goes with you everywhere.

While others have touted paradigm shifts in their visions of PCS and PCNS, CELSAT's innovative concept creates a viable platform for these visions to become an economic and business success story. Sometimes the most innovate ideas are the simplest ones. The New American Heritage Dictionary defines innovation "to begin or introduce something new; be creative." We believe CELSAT fully meets this definition as well or better than any satellite communications system proposed to date.

Second: The application must make a technical showing

The FCC continued with the rule that an experiment will not "be absolutely required to obtaining a preference," but a demonstration of technical feasibility remains a requirement. Because each independent element of CELSAT's system uses proven technology, no compelling need exists for CELSAT to file an experimental license.

CELSAT's U. S. Patent #5,073,900 for its system architecture integrating satellites and ground cellular into one system through a network controller using CDMA spread spectrum technology (SUPPLEMENTAL APPENDIX B) attests to its showing on the merits. Clearly, the U. S. Patent office determined that CELSAT's architecture was unique as they decided to issue the patent.

The capacity claims and spectral efficiency breakthroughs are based on extensive calculations and link budgets developed by CELSAT that went largely unchallenged during the recent comment phase provide further evidence of the technical superiority of the CELSAT design.

Third: The proposal must bring out the capabilities of the technology or bring them to a more advanced or effective state.

TABLE I, Sec. I, *supra*, compares the key satellite characteristics of CELSAT's Celstar system with the concepts proposed by Motorola, LQSS and TRW. All parameters in TABLE I relate to performance over the United States, the area of interest in these proceedings. Celstar provides over eight times the circuit capability as the next best proposal (Loral Qualcomm) and can therefore serve eight times as many Americans. This does not count the 700,000 or more ground circuits available to CELSAT users *in the same frequency band*. These additional circuits permit a second order of magnitude more users for the Celstar system. This clearly represents "bringing out the capabilities of the technology to a more advanced and effective state."

All applicants, including CELSAT, have appropriately stressed frequency efficiency as one of the most important attributes of a service offering proposed to the FCC. Spectrum represents an incredibly precious resource that should be used wisely. Motorola has done well in this regard as compared to the other LEO/MEO systems, twice that of Loral Qualcomm and three times better than TRW. CELSAT's 454% frequency efficiency advantage over Motorola places us alone at the top of the class. The frequency efficiency becomes absolutely unprecedented when the additional order of magnitude improvement from ground circuits in the same frequency band is considered.

Fourth: The proposal must represent a substantial change

The FCC states (D.90-217 Report & Order, 6 FCC Rcd at 3494.) "An innovation... which involve(s) a substantial change from that which existed prior to the time the preference is requested." CELSAT will offer 20 million people in rural America, who have no access to cellular service in their home territories

today, and urban America the lowest possible price (less than 25 cents per minute) for a voice circuit. Satellite circuit costs, less than one-eighth that of the nearest competitor, make these prices possible.

Fifth: The proposal must represent a significant effort

The effort expended by CELSAT to reach a position where it could file for a Pioneer's Preference has been substantial in time, and founders' resources. The thoroughness, scope, quality and detail of the materials presented attest to the sizable effort. This effort is discussed further at Sec. V.C., *infra*.

C. CELSAT's Request For Preference Can Be Limited In Scope

A grant of a Pioneers Preference to CELSAT will not result in the kind of monopoly scene which the oponents have painted:

"CELSAT proposes that, if the Commission were to adopt its proposed rule changes, that it be awarded a monopoly license for use of the spectrum requested on "an exclusive, primary basis." This request is inconsistent with the Commission's rules governing award of a pioneer's preference and those governing provision of satellite communications services in the RDSS bands." LQSS Opposition, PP. p. 12-13.

While it is correct that CELSAT seeks a nationwide preference as the primary licensee for the space segment of its HPCN proposal, if the Commission goes along with either of the band sharing proposals discussed above (paras. I.B.2 and I. B. 3.), then the scope of CELSAT's request can and should be narrowed accordingly. Under space band sharing CELSAT's request logically would extend a preference on a nationwide basis vis-a-vis either Motorola (under sharing described in para. I.B.2) or the "Gang of Four" (under sharing via para. I.B.3.) In neither case would a monopoly result, and the Commission's pro-

competitive policies would be both preserved and enhanced.³³ In other words, while CELSAT seeks an HPCN preference, it is not seeking a monopoly over all MSS/RDSS services.

As for the regional ground cells, CELSAT will amend its Request to seek a preference for only as many regional ground cell markets (i.e., HPCN "clusters" or "hub regions") as it reasonably needs for its totally sound technical, operating and financial/business purposes to ensure the viability of the total space/ground system. (At present, CELSAT believes that this would require a CELSAT secondary license for at least three or four diverse regions.) Under this modification, several regions will be left available to be built out by other secondary licensees.

V. CELSAT OTHERWISE MEETS THE CRITERIA FOR A PREFERENCE

Recognition of the strength and merits of CELSAT's Pioneer Preference request appears to be related inversely to both the qualifications of the party reviewing it and the vituperativeness with which it expresses its opposition. The best evidence of this is the opening comment of Loral/Qualcomm -- perhaps the party most qualified to appreciate the true magnitude of CELSAT's contribution to space/ground personal/mobile communications and to spectrum conservation and, ironically, the party which (other than CELSAT) stands to gain the most³⁴ should the Commission reward CELSAT for its innovativeness:

"CELSAT's pioneer's preference request is a travesty. It makes [its] request despite having no right to use the technology on which its proposal rests, despite not having pioneered any

³³ The Commission established a Pioneer's Preference in order to reward innovators who develop new technologies that lead to the introduction of a new communications service or to the substantial enhancement of an existing service. The recipient of a pioneer's preference is permitted to have its license application granted without being subject to competing applications. See Establishment of Procedures to Provide a Preference to Applicants Proposing an Allocation for New Services, 6 FCC Rcd 3488, 3492 (1991), recon. granted in part, FCC 92-57 (February 26, 1992) ("Pioneer's Preference Decision").

³⁴ Whether as a sharer of the band with CELSAT, or merely as the proprietor of valuable CDMA technology, Qualcomm stands to enjoy a market many times greater if CELSAT's HPCN concept is adopted than what it might hope to enjoy without HPCN's presence.

technology in its proposal, despite not having filed an application, despite not having any basis for not having timely filed to participate in current RDSS processing group, and despite the complete lack of any showing of viability for its proposal. The Commission should dismiss CELSAT's pioneer's preference request and protect the integrity of its processes by making it clear that such baseless requests will be denied." LQSS, Opposition, PP , p. 1-2.

Also,

". . . CELSAT has still not filed an application. Not only does this fact raise questions about CELSAT's bona fides and the truthfulness of its representations, but also it makes CELSAT's pioneer's preference request defective." LQSS Opposition, PP. p. 8.

Obviously, such rhetoric is the sign of either a scared or a jealous opponent, or both.

Clearly, CELSAT proposes a level of innovation that by far exceeds any other satellite proposal. The overall concept of a hybrid space and ground cellular system and a network controller to regulate traffic to either a space cell or a ground cell has never been proposed before. CELSAT meets both the letter of the FCC's Pioneer's Preference criteria and the spirit of the order to provide incentive for entrepreneurial firms to develop the technology that will maintain American leadership in communications products and services. Accordingly, the arguments concerning the alleged disclosure deficiencies, the fact that CELSAT's first choice spectrum was not adopted at WARC, and the other technicalities which the parties have raised in avoidance of the merits should be disregarded.

A. The Application Issue Is A Red Herring

Straining for technicalities by which to have CELSAT's Petition and Pioneers Preference request bumped from any further Commission review, the opponents have all gathered around the same faulty argument - namely, "no application, no grant" -- in total disregard of what the Commission has clearly stated in revisiting its pioneers preference requirements, *supra*.³⁵

³⁵ See, e.g., Motorola, LQSS and TRW:

"Absent a comprehensive system application setting forth the basic parameters of its proposed system, it is impossible for the Commission and other interested parties to evaluate the claimed innovations and technical feasibility of Celstar." Motorola Comments, pp. 24

And,